Mathematics
Grade 8

TOPIC:
Algebraic Expressions (2)

ALGEBRAIC LANGUAGE

Variables and Constants

1. Identify the variables and constants in each formula:

   a) $P = 4s$ (Perimeter of a square)

   b) $A = \pi r^2$ (Area of a circle)

   c) $C = 2\pi r + 5$

   d) $V = lwh$ (Volume of a rectangular prism)

Interpreting Rules

2. Write what each formula represents in words:

   a) $y = 3x + 7$ b) $A = \frac{1}{2}bh$ c) $d = st$

Conventions and Terms

3. For the expression: $5x^2 - 3xy + 7y - 2x + 9$

   a) How many terms does it have?

   b) Write down all the like terms

   c) Write the expression in descending order of x.

Coefficients and Exponents

4. For each term, identify the coefficient and exponent:

   a) $7x^3$ c) x e) $\frac{2}{3}m^4$

   b) $-4y^2$ d) $-ab^2$ f) 12

CLASSIFYING TERMS

Like and Unlike Terms

5. Group the following terms into like terms:

   $3x$; $-5y$; $7x^2$; $2x$; $-4x^2$; $8y$; $-x$; $6y$; x^2 ; 10

Adding and Subtracting Like Terms

6. Simplify the following expressions:

   a) $5x + 3x - 2x$

   b) $7y - 4y + 9y - y$

   c) $\frac{2}{3}a + \frac{1}{3}a - \frac{1}{4}a$

   d) $8m - 3n + 5m - 7n$

   e) $3x^2 + 5x - 2x^2 + 4x - 7$

Multiplication

7. Simplify the following:

   a) $3 \times 5x$

   b) $-4 \times 7y$

   c) $\frac{1}{2} \times 6x$

   d) $2x \times 5x$

   e) $\frac{2}{3}a \times 9a^2$

Multiply monomials by binomials

8. Simplify the following:

   a) $3(x + 4)$

   b) $-2(3y - 5)$

   c) $\frac{1}{2}(4x + 8)$

   d) $\frac{2}{3}a(3a - 6)$

   e) $-\frac{1}{4}x(8x + 12)$

Multiply a monomial by a trinomial

9. Simplify the following:

   a) $2(3y^2 + 4y - 5)$

   b) $5m(m^2 - 2m - 3)$

   c) $-4a(2a^2 - 3a + 1)$

   d) $\frac{1}{3}x(6x^2 - 9x + 12)$

Division

10. Simplify the following:

    a) $12x \div 3$

    b) $-20y \div (-4)$

    c) $18a^2 \div 6a$

    d) $(15x + 10) \div 5$

    e) $(12y^2 - 8y) \div 4y$

    f) $(\frac{2}{3}x + \frac{1}{3}) \div \frac{1}{3}$

Simplifying Algebraic Expressions

11. Simplify completely:

a) $3(2x + 4) - 2(x - 3)$

b) $\frac{1}{2}(6a + 8) - \frac{1}{4}(8a - 4) + 3$

Powers and Roots

12. Calculate (2 marks each):

a) $(3x)^2$

b) $(2y)^3$

c) $\sqrt{(16x^2)}$

d) $\sqrt[3]{(27a^3)}$

e) $(5m^2)^2 - (2m^2)^2$

Substitution

13. Find the value of each expression when $x = 3$ and $y = -2$:

a) $5x + 7$

b) $3y - 4$

c) $x^2 + y^2$

d) $\frac{1}{2}x + \frac{3}{4}y$

e) $\frac{2}{3}x^2 - \frac{1}{3}y + 1$

Bonus Challenge Question

14. Simplify completely: $2x(3x - 4) - 3(x^2 - 2x + 1) + 5x - 7$

CAPS CLARRIFICATION:

Algebraic language

- **Revise** the following done in Grade 7:
  - recognize and interpret rules or relationships represented in symbolic form
  - identify variables and constants in given formulae and equations
- Recognize and identify conventions for writing algebraic expressions
- Identify and classify like and unlike terms in algebraic expressions
- Recognize and identify coefficients and exponents in algebraic expressions

Expand and simplify algebraic expressions

Use commutative, associative and distributive laws for rational numbers and laws of exponents to:

- Add and subtract like terms in algebraic expressions
- Multiply integers and monomials by:
  - monomials
  - binomials
  - trinomials
- Divide the following by integers or monomials:
  - monomials
  - binomials
  - trinomials
- Simplify algebraic expressions involving the above operations
- Determine the squares, cubes, square roots and cube roots of single algebraic terms or like algebraic terms
- Determine the numerical value of algebraic expressions by substitution

Equations

• Revise the following done in Grade 7:

-- Set up equations to describe problem situations

-- Analyse and interpret equations that describe a given situation

-- Solve equations by inspection

-- Determine the numerical value of an expression by substitution.

-- Identify variables and constants in given formulae and equations

• Extend solving equations to include:

-- Using additive and multiplicative inverses

-- Using laws of exponents

-- Use substitution in equations to generate tables of ordered pairs